

**THE IMPACT OF INFORMATION COMMUNICATION TECHNOLOGY ON  
STOCK RETURNS AND TRADING VOLUMES FOR COMPANIES QUOTED AT  
THE NAIROBI STOCK EXCHANGE**

**BY**

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## DECLARATION

This research is my original work and has not been submitted for a degree in any other university.

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D61/8804/2005

This project has been submitted for examination with my approval as the University supervisor

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## **DEDICATION**

I dedicate this project to my lovely family who gave me support in the course of undertaking this research.

## **ABSTRACT**

This study sought to investigate the impact of ICT on the stock returns and trading volume in Nairobi Stock Exchange. The specific objectives of the study included to examine impact of information technology on stock returns at Nairobi Stock Exchange and to investigate effects of information technology on trading volume at Nairobi Stock Exchange. This study used descriptive design to achieve these objectives. A census survey for all the companies quoted at the NSE was done for the period 2005-2010.

This study used secondary data obtained from NSE, company website and financial statements. Stock trading volumes was used to test the impact of ICT. The study determined prices effects of IPO announcement by testing the statistical difference of the mean daily return of the event period (observation period with the mean daily return of the comparison period. The comparison period for this study comprised of 45 surrounding days before the event study and 45 surrounding days after the IPO window. Descriptive statistics such as mean, standard deviation and percentages were used for analysis. The results of the findings were presented in charts, figures and tables.

The study found that that the market was very sensitive to various change that were as result of adoption of ICT at NSE, the daily mean return had a mean of 0.12 and standard deviation of 0.212, this was also seen in the case of trade volume where trade volume had a mean of 0.053 and standard deviation of 0.06. Mean return and trade volumes fluctuation were very low before adoption of ICT nearing the event day they were slightly greater fluctuation in the value of trade volumes and mean daily return, mean daily return was seen to be lagging behind the trade volumes. Two days prior to the adoption of ICT there was slightly greater fluctuation in both mean daily return and trade volumes. On the event day trade volumes realized a greater fluctuation compared to mean daily return. It is evident therefore that the adoption of ICT by NSE increased the mean daily return and trade volume. This study recommends that more studies should be done in the area of factors affecting stock returns and trading volume for companies quoted in Nairobi Stock Exchange.

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## **LIST OF ABBREVIATIONS**

AGM:	Annual General Meeting
CAR:	Cumulative Abnormal Returns
FEM:	Foreign Exchange Market
ICT:	Information Communication and Technology
IMM:	Interbank Money Market
IT:	Information Technology
KPTC:	Kenya Posts and Telecommunications Corporation
NSE:	Nairobi Stock Exchange
OTCBB:	Over the Counter Bulletin Board

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background of the Study

ICT is an acronym that stands for "Information and Communication Technologies" and is used often in the context of "ICT roadmap" to indicate the path that an organization will take with their ICT needs. The term ICT should be read as "Information Technology and Communication Technology" literally to clarify its meaning which refers to the merging (convergence) of telephone networks with computer networks through a single cabling or link system. The term ICT has grown in usage out of huge economic incentives (huge cost saving due by eliminating the telephone network) to merge the telephone network with the computer network system.

The usage of information communication and technology (ICT), broadly referring to computers and peripheral equipment, has seen tremendous growth in service industries in the recent past. The most obvious example is perhaps the banking industry, where through the introduction of ICT related products in internet banking, electronic payments, security investments, information exchanges, banks now can provide more diverse services to customers with less manpower. Seeing this pattern of growth, it seems obvious that ICT can bring about equivalent contribution to profits (Berger, 2003).

In capital markets just like in any other business, access to accurate and timely information is important. ICT provides the opportunity to have this accurate and timely information in the operations of a stock market. The fluctuations in stock market and trading volume are influenced by the flow of information. The higher the volume, the narrower are the spreads, as a result there is less slippage, and less volatility. Traders keep a close eye on trading volume because it reflects the dynamic interplay between informed traders and uninformed traders who interact with each other in the marketplace in light of their own trading strategies and, ultimately, set market clearing prices. Trading volume is termed as the critical piece of information in the stock market because it either activates or deactivates the price movements.

Stock prices are usually influenced by positive trading volume through the available set of relevant information in the market (Gallant, 1992).

A revision in investors' expectations usually leads to an increase in trading volume which eventually reflects the sum of investors' reaction to news. The relationship between stock returns and trading volume and volatility is well researched area in developed markets. If the news is unexpectedly bad the price of the securities decreases and if the news is unexpectedly good then it has a positive effect on the price movements of the securities. These movements are supposed to be influenced by the above-average trading activity in the market as it adjusts to a new equilibrium. Since the volume-volatility variables simultaneously change in response to the arrival of new information thus there shall be no information content in past volatility data that can be used to forecast volume (Deo, 2008).

On contrary to mixture-of-distribution hypothesis (MDH), the sequential information arrival hypothesis (SIAH), again a focal terminology of volume-volatility relationship explains the role of the lagged values of volatility in predicting current trading volume; a view by Darrat *et al.* (2003). They further explain that traders tend to receive information in a sequential, random manner where all traders revise their expectations accordingly. According to this hypothesis, traders do not receive the information at the same time which creates incomplete equilibrium. To reach the final equilibrium, all traders tend to react to the information signal simultaneously so that current trading volume can be predicted with accuracy. Suominen (2001) has explained the positive correlational effect between trading volume and price variability based on private information. He has demonstrated that price changes are not sufficient source in predicting volatility but the information content on trading volume is also needed.

As stressed by Mustafa and Nishat (2008) the non-informational trade based on events, short selling and insider trading has significant effect on prices and trading activity. Lee and Rui (2001) have explained the relation between trading volume and serial correlation of stock returns by including another variable named as shocks i.e. informational and non-informational components. They suggest that trading volume is influenced by non-informational trades and stock returns by informational trades. Lamoureux and Lastrapes

(2000) have adopted GARCH model to explain the conditional volatility of returns is influenced by trading volume. Chen *et al.* (2001) find persistence of volatility is not eliminated when trading volume is used in the GARCH model. Bollerslev and Jubinski (1999) suggest that by imposing long memory component on differing short-lived news, the joint volume-volatility relationship can be exercised.

Based on the available set of information about a company, its stock prices reflect investors' expectations on the future performance for the company. Since investors' perception varies the interpretations of new information, prices usually remain unchanged even though new information reveals to the market. This is because some investors interpret it as good news and some take it as bad news. Therefore, changes in prices reflect the average reaction of investor to news. Sun (2003) finds negative correlation of returns before earnings announcements indicating that pre-earnings trading is likely non-informational and the availability of asymmetrical information is small. Charavarty, Gulen and Mayhew (2004) stress on the importance of price discovery for the investors interested either in the options market or stock market. They suggest that price discovery is higher when bid-ask spreads are narrow and the trading volume is high Barclay and Hendershott (2003) suggests that price discovery first starts from the high volume stocks and then spreads to low volume stocks and the trading volume after hours is low because of high risks level and high trading costs.

Gallant, Rossi and Tauchen (2002) have examined the dynamic interrelationship between the price-volume-volatility of the stock market. They reveal that the daily trading volume and the magnitude of price change is positively and nonlinearly related to each other and also price changes lead to volume movements. Similarly, Fujihara and Mougoue (2007) find strong non-linear causal relationship between futures' price variability and the trading volume indicating the impact of current trading volume in the prediction of future prices. Through the application of three equation simultaneous structural model, Wang and Yau (2000) demonstrate that the current volume and lagged volume helps in explaining price volatility. Deo *et al.* (2008) demonstrate a significant contemporaneous relationship between trading volume and absolute value of price changes. They have stressed with strong evidence that in their selected Asia-Pacific Stock market return caused volume rather than volume causing returns.

### **1.1.1 Information Communication and Technology**

Kenya, a country on the eastern coast of Africa, covers a surface area of 582,664 square kilometers with a population of about 30 million. The capital city is Nairobi with a population of about 3 million people. Other big cities and towns include Mombasa, Kisumu, Nakuru and Eldoret. In 2003 the GDP per capita was about US\$ 390. From introduction of telecommunication services in the country up to 1977, the services in Kenya were managed as part of a regional network with neighboring Tanzania and Uganda. In 1977, the East African Community under which the regional telecommunications services operated collapsed and as a result, the Government of Kenya established Kenya Posts and Telecommunications Corporation (KP&TC) to run the services ([www.cck.go.ke](http://www.cck.go.ke)).

A telecommunications policy statement was issued in 1997 that set out the government vision on telecommunications development to the year 2015. The challenge at that time was to transform the existing policy structure from one designed for a monopoly to a policy managing a liberalized telecommunication market ([www.cck.go.ke](http://www.cck.go.ke)). The government separated the functions and management of the sector. This clarified roles for the policy, regulatory and operational responsibilities with the government and specifically the Ministry of Transport and Communications retaining policy guidance. In 1998/99, the government launched the telecommunications sector reform and introduced competition in certain market segments, while at the same time disbanding KP&TC.

Since the launch of the telecommunication sector reform, Kenya has made great strides in the expansion of telecommunications services. From 1999 to-date, the government has implemented policy reforms that have resulted in a number of structural changes. The main structural changes are – redefinition and clarification of roles for policymaking, market regulation, dispute resolution and operation of services among multiple players. In the operation of services, multiple operators are competing in various market segments based on a policy of the private sector operating in a competitive environment that also safeguards consumer interest ([information.go.ke](http://information.go.ke)). While the growth of the ICT sector in Kenya has been significantly influenced by global trends, it can be evaluated in terms of number of fixed and mobile telephone lines; the tele-density; the number of computers and services; Internet

Service Providers (ISPs), the number of Internet users; broadcasting stations; and market share of each one of them (information.go.ke)

### **1.1.2 Nairobi Stock Exchange**

This market was started in the 1920's by the British as an informal market for Europeans only. The administration of the Nairobi Stock Exchange Limited is located on the 1st Floor, Nation Centre, Kimathi Street, Nairobi. As a capital market institution, the Stock Exchange plays an important role in the process of economic development. It helps mobilize domestic savings thereby bringing about the reallocation of financial resources from dormant to active agents. Long-term investments are made liquid, as the transfer of securities between shareholders is facilitated. The stock exchange has also enabled companies to engage local participation in their equity, thereby giving Kenyans a chance to own shares.

Companies can also raise extra finance essential for expansion and development. To raise funds, a new issuer publishes a prospectus which gives all pertinent particulars about the operations and future prospects and states the price of the issue. A stock market also enhances the inflow of international capital. They can also be useful tools for privatization programmes. The Nairobi Stock Exchange is at present made up of eighteen stock broking firms. These members of the Nairobi Stock Exchange transact business mainly on the Nairobi market, with a limited proportion of business conducted in foreign securities through overseas agents. The stock brokers act as financial advisers to their clients and also carry out their orders.

The Nairobi Stock Exchange deals in both variable income securities and fixed income securities. Variable income securities are the ordinary shares which have no fixed rate of dividend payable as the dividend is dependent upon both the profitability of the company and what the board of directors decides (with ratification by the shareholders in an AGM). The fixed income securities include Treasury and Corporate Bonds, preference shares, debenture stocks - these have a fixed rate of interest/dividend, which is not dependent on profitability. The stock market consists of both the primary and secondary markets. In the primary or new issue market, shares of stock are first brought to the market and sold to investors. In the secondary market, existing shares are traded among investors.

## **1.2 Statement of the Problem**

The issue of the ICT's impact has been discussed extensively in the literature. However, the impact of ICT on the returns and trading volume, using different cross-sections, has not yet been researched. A limited aspect of this issue was examined by Benbunan & Fich (2004). Benbunan and Fich (2004) examined how 373 messages published on websites affected the company's value, using an event study approach during the period 1996–2001. They discovered that the company's value rose 5% as a result of the messages, an effect that lasted for a period of time after the messages' publication. Local studies have equally been dismal on this topic with Masaki (1991) studying the behaviour of share prices in the NSE in an empirical investigation into the behaviour of annual corporate earnings among Kenyan publicly quoted companies. Masaki found out that the corporate earnings had a negative serial correlation while the runs test and the computed mean autocorrelation coefficients were not significant so as to initiate any doubt for lack of independence. Masaki also concluded that successive changes in the reported annual corporate earnings for Kenyan publicly quoted companies are essentially independent and can be well approximated by a random-walk. His findings were also consistent with the studies in other countries.

Moko (1995) looked at the relationship between offering price at the subscription rate of initial public offering at the NSE. He found out that there was a significantly large return for the initial subscribers, adjusted for market effects in the short-run following the offering. The result of his study showed that discount on new issues had an association with the rate of subscription. Nyamute (1998) went on to carry out a study on the relationship of the NSE index of major economic variables: inflation rate money treasury bills rate and exchange rate. He found out that these variables have an impact on the performance of the stock exchange (as measured by the stock index), the treasury bills and the exchange rates were generally more significant than either the inflation or money supply.

Previous studies have not focused on the impact of information technology on stock returns and trade volumes, for example, Nyambati (2001) did a research on information technology planning practices in Kenyan banks, Onduso (2001) focused on a survey of ethical issues in the use of information technology among commercial banks in Kenya, Abwao (2002) studied



information technology applications in business management within Kenyan companies. A survey of insurance firms in Nairobi, Kipsang (2003) did a survey of outsourcing information technology services by commercial banks in Kenya, Mbithi (2004) studied service delivery approaches and the strategic positioning of information technology management consultancy firms in Kenya and Ngure (2008) researched on competitive strategies employed by selected branded software and hardware providers in the information technology industry in Nairobi.

There have been astonishing developments of telecommunication and the information technology worldwide. With the increase of trade frequency, data has become more available, and more research has been conducted on the process of information transfer and its impact on financial markets. Notwithstanding the existence of numerous studies on ICT on one hand market efficiency on the other, no prior study has sufficiently integrated these two issues. As noted, there is no known study that has been done on the impact of Information technology on stock returns and trading volume at the Nairobi Stock Exchange. This study, therefore, sought to investigate the impact of information technology on stock return and trading volume. This study is motivated to fill this gap in knowledge by investigating the impact of ICT on stock returns and trading volume in Nairobi Stock Exchange. The study seeks to answer the questions, what is the impact of information technology on stock returns at Nairobi Stock Exchange? What are the effects of information technology on trading volume Nairobi Stock Exchange? It will examine whether investors change their investment strategy as a result of new information made available to them when, for instance a corporate website is launched. The use of electronic sites for distributing financial information has increased in recent years, and many companies are using this media tool for publishing information for potential investors.

### **1.3 Objectives of the Study**

The objectives was to investigate the impact of ICT on stock returns and trading volume in Nairobi Stock Exchange

#### **Specific Objectives**

1. To examine impact of information technology on stock returns at Nairobi Stock Exchange

2. To investigate effects of information technology on trading volume at Nairobi Stock Exchange

#### **1.4 Importance of the Study**

**Capital Markets Authority:** The findings of this study will be of interest to the Capital Markets Authority. They will be able to determine the impact of ICT on stock returns and trade volumes hence keep abreast with the right ICT.

**Government:** The government of Kenya will be enlightened in a bid to make policies relating to future ICT at NSE. Through knowledge of the effects of price movements on the value of the firms will assist in ascertaining the appropriate guidelines to be in place for firms financing. The government will also be informed on how it can protect the investors and encourage more investments for the growth and development of the national economy.

**Investors:** The investors will also benefit by getting a reliable platform where they can access the information they need to make investment decisions.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

In this chapter emphasis is on information technology and its impact on stock return and trading volume. Section 2.1 is the introduction and section 2.2 presents literature review on stock return and trading volume, section 2.3 market efficiency, section 2.4 efficient market hypothesis, section 2.5 empirical evidence on market efficiency, section 2.6 empirical evidence on technology and stock returns, and section 2.7 summary.

#### **2.2 Stock Return and Trading Volume**

According to (McKenzie & Faff, 2003) , the condition correlation of stock returns is highly dependent on trading volume for individual stocks but not for the index, reflecting the fact that liquidity disparity for stocks has a significant impact at individual level but not at aggregate level. Regarding other few studies including Turkish stock market, (Guner & Onder, 2002) have found out a significant relationship between volatility and trading volume. Specifically, they have found out that even though higher volatility is associated with low volume stocks in general, for morning session, high volume stocks also exhibit high volatility stemming from the intensity of information-based trading for high volume stocks in stock market opening.

During early nineties the non-informational factors greater influence on stock market activity in Pakistan. These factors are including structured changes in stock market, constructing the stock price index, based on market capitalization. Omran & Mckenzie (2000) investigated the relation between volume of trade and conditional variance of trade and found the significant relation between timing of innovational outliers in returns and volume. Fluctuation in trading activity is not only explained by publicly available information but also by non-information trade due to events, It indicates that stock returns moved too much due to change in the fundamentals, trading volume, and changes in effective risk aversion of market participants (Mustafa, 2002). Wang (2004) examined the relationship between aggregate stock market

trading volume and the correlation of daily stock return they found that a stock price decline on high volume day is more likely than a Stock price decline on low volume day to be associated with an increase in the expected stock return. Viswanathan (2003) report quite contradictory results specifying that high adverse selection costs and thus higher return volatility are found at times of the day with higher trading volume. Sabri (2004) has discovered that trading volume represent one of the main factors in predicting return volatility Harrold (2004) the interaction between various traders leads to patterns in trading volume bid-ask spread, variability, and returns.

Lipson (2004) argue that the size of trades or volume has a significant effect on return volatility. The basic logic to use the volume is that the trading activity has explanatory power in addition to past returns, and price changes accompanied by high volume tend to be reversed. The relationship between stock prices and trading volume in context of Karachi stock market's daily data for very small time period i.e. nine months data. He found that significance of non-informational trade in explaining the fluctuations in stock prices (Ali, 1997). Suggested by Morgan (1999), volume is regarded as a major risk factor contributing to the volatility of returns, particularly in less liquid and thin markets including emerging markets. Gunduz & Hatemi (2005) determined that there is a co integrating relationship between stock price changes and volume in stock market indicating a long term relationship between these variables resulting from the information based effect of volume on price changes as well as the encouraging impact of positive price changes on trading volume.

Numerous papers have documented the fact that high stock market volume is associated with volatile returns (Jain & Joh, 1998; Mulherin & Gerety, 1999). Omran & Mckenzie (2000) investigated the relation between volume of trade and conditional variance of trade and found the significant relation between timing of innovational outliers in returns and volume. Recent empirical studies have investigated the dynamic relationship between trading volumes and returns. Due to inadequate regulatory and weak enforcement of rules, there has risen the problem like as insider trading and unchecked margin requirement trading. As a result these created the leverage (Nishat, 2001), which can easily forced investors in bankruptcy problem if the investors expectation about future prices are not realized.

### **2.3 Market Efficiency**

Efficient market is one where the market price is an unbiased estimate of the true value of the investment. Market efficiency does not require that the market price be equal to true value at every point in time (Rouwenhorst & Geert, 2009). All it requires is that errors in the market price be unbiased, i.e., that prices can be greater than or less than true value, as long as these deviations are random. The fact that the deviations from true value are random implies, in a rough sense, that there is an equal chance that stocks are under or over valued at any point in time, and that these deviations are uncorrelated with any observable variable. For instance, in an efficient market, stocks with lower PE ratios should be no more or less likely to under valued than stocks with high PE ratios. If the deviations of market price from true value are random, it follows that no group of investors should be able to consistently find under or over valued stocks using any investment strategy (Tumarkin, 2000).

Recent advances in information and communications technology have improved the state of securities markets. First, technology allows information to be disseminated to a broad base of investors in real time and at low cost, thus expanding the universe of investors with access to information. Second, technology is also reducing the barriers to entry for providing financial services (e.g. market making and brokerage) and the resulting competition is driving down transaction costs. In addition to facing lower commissions, institutional and retail investors – aggressively pursued by competing intermediaries - now enjoy unprecedented ease of trade execution (via such innovations as online accounts). These changes are expanding market participation and facilitating dramatic increases in trading volume (Bollerslev & Jubinsk, 1999).

Third, one could argue with less certainty that technology is indirectly improving the quality of investors' legal rights. In some areas, technology in conjunction with new regulations is leveling the playing field for individual investors. A recent example is the SEC's Regulation FD, which stems selective information disclosure by senior management. Management conference calls, previously limited to favored investment bank analysts and large fund managers, are now open to the general public via live Internet telecasts. On the other hand, improvements in technology have made it easier for corporate insiders and financial

intermediaries to quickly trade on private information about customer order flow or company valuation. Moreover, many such trades often go unreported, especially when they take place in over the counter derivative markets. The overall effect of technological advance on investor rights remains unclear (Fujihara, 2007).

The same rapid technological advances that are driving the marginal cost of information dissemination and trade execution to zero may also have implications for the incentives faced by information producers. As trading costs fall, the marginal investor may be becoming less experienced, less sophisticated, and less able to derive fundamental security values from raw information (Bachelier, 2003). At the same time, the characteristics and business models of publicly traded companies are changing as the economy itself changes. Newly listed firms are far less likely to generate sufficient cash flows in the near term to internally finance the costs of expansion and compensation. A high current stock price becomes a vital cash substitute for these firms. These trends combine to create strong incentives for firms to distort the information they produce to the investor community.

There is evidence of deterioration in the quality of information that firms supply to investors. This deterioration may slow down the improvements in security markets that technological progress brings about. Moreover, private mechanisms such as litigation and information packaging by financial intermediaries are unlikely to solve the problem of information quality. Investor education and the regulation of information disclosure in particular may therefore play an important role in the development of securities markets in the foreseeable future (Beaver & Kunter, 2004).

## **2.4 Efficient Market Hypothesis**

The Efficient Market Hypothesis, developed by Fama (1965) at the University of Chicago in the early 1960s, says that everything that can be known about a stock has already been incorporated into the price of that stock. From this hypothesis have come many of the theories that we use to explain the financial markets: the arbitrage principles of Miller and Modigliani, the portfolio principles of Markowitz, the Capital Asset Pricing Model of Sharpe, Lintner, and Black, and the Option-Pricing Model that won for Black, Sholes, and Merton the Nobel Prize.

There are three major versions of the hypothesis: weak, semi-strong, and strong. Weak EMH claims that prices on traded assets (*e.g.*, stocks, bonds, or property) already reflect all past publicly available information. Semi-strong EMH claims both that prices reflect all publicly available information and that prices instantly change to reflect new public information. Strong EMH additionally claims that prices instantly reflect even hidden or "insider" information. There is evidence for and against the weak and semi-strong EMHs, while there is powerful evidence against strong EMH (Fama, 1970).

Beyond the normal utility maximizing agents, the efficient-market hypothesis requires that agents have rational expectations; that on average the population are correct (even if no one person is) and whenever new relevant information appears, the agents update their expectations appropriately. Note that it is not required that the agents be rational. EMH allows that when faced with new information, some investors may overreact and some may under react. All that is required by the EMH is that investors' reactions be random and follow a normal distribution pattern so that the net effect on market prices cannot be reliably exploited to make an abnormal profit, especially when considering transaction costs (including commissions and spreads). Thus, any one person can be wrong about the market indeed, everyone can be but the market as a whole is always right. There are three common forms in which the efficient-market hypothesis is commonly stated weak form efficiency, semi-strong-form efficiency and strong-form efficiency, each of which has different implications for how markets work (Fama, 1970).

In weak-form efficiency, future prices cannot be predicted by analyzing prices from the past. Excess returns cannot be earned in the long run by using investment strategies based on historical share prices or other historical data. Technical analysis techniques will not be able to consistently produce excess returns, though some forms of fundamental analysis may still provide excess returns. Share prices exhibit no serial dependencies, meaning that there are no patterns to asset prices. This implies that future price movements are determined entirely by information not contained in the price series. Hence, prices must follow a random walk. This soft EMH does not require that prices remain at or near equilibrium, but only that market participants not be able to systematically profit from market inefficiencies. However, while EMH predicts that all price movement (in the absence of change in fundamental information)

is random (i.e., non-trending), many studies have shown a marked tendency for the stock markets to trend over time periods of weeks or longer and that, moreover, there is a positive correlation between degree of trending and length of time period studied but note that over long time periods, the trending is sinusoidal in appearance). Various explanations for such large and apparently non-random price movements have been promulgated. But the best explanation seems to be that the distribution of stock market prices is non-Gaussian (in which case EMH, in any of its current forms, would not be strictly applicable) (Michaely, Thaler, & Womack, 1993).

The problem of algorithmically constructing prices which reflect all available information has been studied extensively in the field of computer science. For example, the complexity of finding the arbitrage opportunities in pair betting markets has been shown to be NP-hard. In semi-strong-form efficiency, it is implied that share prices adjust to publicly available new information very rapidly and in an unbiased fashion, such that no excess returns can be earned by trading on that information. Semi-strong-form efficiency implies that neither fundamental analysis nor technical analysis techniques will be able to reliably produce excess returns. To test for semi-strong-form efficiency, the adjustments to previously unknown news must be of a reasonable size and must be instantaneous. To test for this, consistent upward or downward adjustments after the initial change must be looked for. If there are any such adjustments it would suggest that investors had interpreted the information in a biased fashion and hence in an inefficient manner (Rosenberg, Reid, & Lanstein, 1985).

In strong-form efficiency, share prices reflect all information, public and private, and no one can earn excess returns. If there are legal barriers to private information becoming public, as with insider trading laws, strong-form efficiency is impossible, except in the case where the laws are universally ignored. To test for strong-form efficiency, a market needs to exist where investors cannot consistently earn excess returns over a long period of time. Even if some money managers are consistently observed to beat the market, no refutation even of strong-form efficiency follows: with hundreds of thousands of fund managers worldwide, even a normal distribution of returns (as efficiency predicts) should be expected to produce a few dozen star performers (Rosenberg et al. 1985).



### **2.4.1 Capital Asset Pricing Model**

In finance, the capital asset pricing model (CAPM) is used to determine a theoretically appropriate required rate of return of an asset, if that asset is to be added to an already well-diversified portfolio, given that asset's non-diversifiable risk. The model takes into account the asset's sensitivity to non-diversifiable risk (also known as systematic risk or market risk), often represented by the quantity in the financial industry, as well as the expected return of the market and the expected return of a theoretical risk-free asset. The model was introduced by Jack Treynor (1961, 1962), William Sharpe (1964), John Lintner (1965a,b) and Jan Mossin (1966) independently, building on the earlier work of Harry Markowitz on diversification and modern portfolio theory (Black et al., 1972).

### **2.4.2 Options Pricing Model**

In finance, the binomial options pricing model (BOPM) provides a generalizable numerical method for the valuation of options. The binomial model was first proposed by Cox, Ross and Rubinstein (1979). Essentially, the model uses a "discrete-time" model of the varying price over time of the underlying financial instrument. The Binomial options pricing model approach is widely used as it is able to handle a variety of conditions for which other models cannot easily be applied. This is largely because the BOPM is based on the description of an underlying instrument over a period of time rather than a single point. As a consequence, it is used to value American options that are exercisable at any time in a given interval as well as Bermudan options that are exercisable at specific instances of time. Being relatively simple, the model is readily implementable in computer software (including a spreadsheet) (Cox et al., 1979).

## **2.5 Empirical Evidence on Market Efficiency**

Obaidullah (2002) has examined the investors reaction to information using primary data collected from 600 individual investors and observes that the individual investors are less reactive to bad news as they invest for longer period. Elroy (2001), in his doctoral thesis, observed that the cumulative abnormal returns (CAR) between the portfolios with positive and negative unexpected half-yearly earnings were significant.

Prabina, Srinivasan & Dutta (2004) have studied the reaction of GDR prices and the underlying share prices to the announcement of dividends and found that the CAR for the GDR is mostly negative irrespective of the rate of dividend whereas the domestic share prices react in a more synchronous manner.

An attempt was made by Lukose & Narayan (2002) in their study, examined the changes in the market value of the firm as reflected in the stock price in response to IT investment announcements. Reactions of price and volume were negatively related to firm size and became more positive over time. Lukose & Rao (2002) examined the security price behavior around the announcement of stock splits and around ex-split date. They find that there are 7.69 percent abnormal returns during the two days (i.e. the day of announcement of stock split and the next day).

Bachelier & Louis (2003) conclude that the stock market is inefficient because prices are mean reverting. If stock price follows a mean reverting process, then there exists a tendency for the price level to return to its trend path over time, and investors may be able to forecast future returns by using information on past returns. This tends to make the market inefficient. In a very broad sense, stock market is mean reverting if asset prices tend to fall (rise) after hitting a maximum (minimum).

In Turkey, difference from general literature; researches generally focus on testing the semi strong form (Ajay, 2001; Ball, 2004) or weak form efficiency in Turkish Stock Exchange Market (TSEM). The results of most studies show the weak form efficiency in TSEM (Bachelier, 2003; Lukose, 2002). For example; Lukose, (2002) tests weak form efficiency in Istanbul Stock Exchange Market using weekly data for the period 1990-2005. As employing different techniques (ADF test, unit root with two structural breaks, run test and variance ratio test), he accepts weak form efficiency in Istanbul Stock Exchange Market. But different from the supporting literature, some studies reject semi strong form efficiency (For instance; Beaver & Kunter (2004) test semi strong form efficiency in Foreign Exchange Market, Interbank Money Market and Istanbul Stock Exchange Market with respect to changes in Currency in Circulation for the period 1989-1995 using direct Granger Causality test. They conclude that financial markets are not semi strong form efficient. It is seen that few studies,

in the literature, concentrate on Foreign Exchange Market (FEM) and Interbank Money Market (IMM).

## **2.6 Empirical Evidence on Technology and Stock Returns**

A number of earlier works have used samples of Internet companies and examined their stock price changes resulting from various corporate events. Werner & Murray (2004) examined whether messages on the Net can impact the financial markets. They examined a million and a half messages posted on the sites of Yahoo Finance and Raging Bull for 45 companies included in the Dow Jones Index. They discovered that messages on the Net can help predict the market's volatility.

Cooper *et al.* (2001) examined how the addition of an Internet suffix to a company's name affects its stock price. The sample included all the companies trading on the NYSE, AMEX, NASDAQ, and OTCBB (Over the Counter Bulletin Board) that changed their names during the period between 1 June 1998 and 31 July 1999, a total of 147 companies. They concluded that companies that changed their names earned an AR of 53% during the five days following their announcement.

Tumarkin (2000) examined how general messages advertised on Raging Bull affect stock prices, using a sample of 73 companies. He found that there was no significant change in stock prices for his sample. This finding strengthens the notion of an efficient market. Tumarkin & Whitelaw (2001) examined how financial messages on the Web impact the returns and the trade volume by industry. They found positive ARs in all groups. However, the difference in the ARs between the groups was not statistically significant.

Fong & Yong (2005) examined whether it is possible to create a strategy for obtaining abnormal profits in Internet stocks. Their main conclusion was that it is not possible to build a strategy for obtaining abnormal profits. Benbunan & Fich (2004) examined how 373 messages published on websites affected the company's value, using an event study approach during the period 1996–2001. They discovered that the company's value rose 5% as a result of the messages, an effect that lasted for a period of time after the messages' publication.

Kiyamaz (2001) examined the impact of rumors on stock prices on the Istanbul Stock Exchange (ISE), using a sample of 355 rumors publicized in the column HOTS, appearing in the weekly magazine *Ekonomik Trend (ET)*. He discovered that for positive rumors, there was a positive return during the four days preceding the publication, while for negative rumors, the impact occurred only after the publication of the rumors. Trueman *et al.* (2003) examined how the quarterly profit messages of 403 Internet companies impacted the companies' share prices. They discovered that during the 10 days following the publication of the message, the stock prices rose by 11%.

Rajgopal *et al.* (2002) examined the impact of the management's involvement on the value of Internet companies. Their sample was composed of 57 Internet companies, and they documented each company's management transactions during a period of six months, in 2000. They found that there was an increase in the stock's return as a result of the management's involvement. Durand *et al.* (2003) examined how the Australian market reacted to the messages of 88 Internet and technology companies. They discovered that, on average, there was an AR of 24% during 5 days (A4, 11), around the time of publication. They also found that the strong effect of the Internet companies occurred before the spring of 2000.

## **2.7 Summary**

The clearest contribution of technology to market development is the reduction in trading costs, and the corresponding improvement in the liquidity of secondary markets. Advancing information and telecommunications technology lowers the barriers to entry for investors and the providers of financial services. Technology has catalyzed competition in the brokerage industry and the investor is capturing much of the benefit. Online accounts allow convenient and inexpensive access to the markets. The sections above presents literature review of studies that have been done on the information technology, stock return and trading volume. There are a number of studies on stock returns and trading volume but there is no known study that has been done on information technology and its impact of stock return and trading volume, knowledge gap. This study will therefore seek to close this gap in knowledge by answering the question; what is the impact of information technology on stock returns at

Nairobi Stock Exchange and what are the effects of information technology on trading volume at Nairobi Stock Exchange?

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter provides the methodology of the study. It gives the specific procedures that were followed in undertaking the study. Section 3.2 describes the research design, section 3.3 population, section 3.4 data collection methods and section 3.5 data analysis.

#### **3.2 Research Design**

This study was descriptive design. This design was used as it enables the researcher to have an in-depth understanding of the phenomenon. This design refers to a set of methods and procedures that describe variables. It involves gathering data that describe events and then organizes, tabulates, depicts, and describes the data. Descriptive studies portray the variables by answering who, what, and how questions (Babbie, 2002).

#### **3.3 Population**

The target population of the study consisted of all companies listed at NSE, and includes 45 companies listed at NSE (Appendix of Quoted companies attached). A census survey for all the companies quoted at the NSE will be done for the period 2005-2010.

#### **3.4 Data Collection Methods**

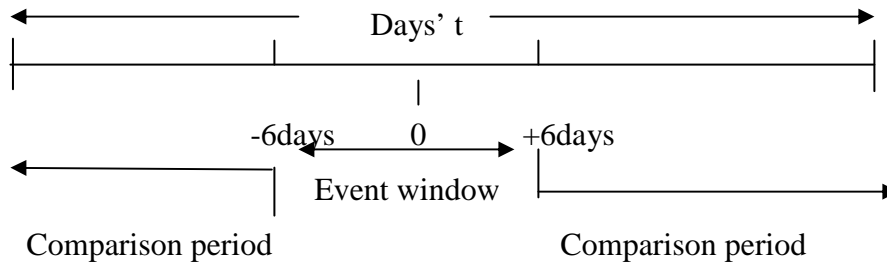
This study used secondary data that was obtained from NSE, company website and financial statements. Stock trading volumes will be used to test the impact of ICT. The objective of this study is to provide a comprehensive examination of the effect of launching an official corporate website on the profitability of the company. To accomplish this goal, at least seven cross-examinations will be performed, including: Abnormal returns (AR) vs. trading volume; Domestic vs. multinational companies; Small vs. large companies; Initial vs. subsequent website launching; The choice of the day of the week for the launch; Industry effects; Early vs. mature time period of the launching phenomenon.

### 3.5 Data Analysis Method

Data analysis shall be carried out using the comparison period return approach (CPRA). Initially modeled by Foster and Vivney (1978) and subsequently refined by Wooldridge (1983). The study determined prices effects of IPO announcement by testing the statistical difference of the mean daily return of the event period (observation period with the mean daily return of the comparison period. The comparison period for this study comprised of 45 surrounding days before the event study and 45 surrounding days after the IPO window.

The study intends to determine the stock movement on daily firms prior to and after the launching of a company website on the stock market, which was computed as a reaction of share prices to new ICT developments in the NSE. Secondary data source will be analyzed using the chart shown below;

#### Events Window



The portfolio daily returns on the stock will be computed on each day surrounding the launch by using the following formula;

$$R_x = \frac{P_x - P_{x-1}}{P_{x-1}}$$

$R_x$  – rate of return for each share on day t

$P_x$  = closing price on share on day t

$P_{x-1}$  = closing price on share on day t-1 (Previous day)

The mean portfolio daily return was also calculated from the website launching window and comparison periods. For each day, t-statistics and test of significance difference between the two period was computed to establish whether excess return around the launching date are different from significant the even affects returns, the sign of the excess return determined the

effect is positive or negative. A computer package, Statistical Package for Social Sciences (SPSS) was used to aid in analysis of the data. Descriptive statistics such as mean, standard deviation and percentages was used for analysis. The results of the findings were presented in charts, figures and tables.



## CHAPTER FOUR

### ANALYSIS, RESULTS AND DISCUSSION

#### 4.1 Introduction

This chapter presents information as was collected from secondary data from the NSE. Analysis and interpretation on mean return, trade volume were done using the data obtained on a sample of 45 companies on a period of six days prior and day on the introduction of ICT at NSE and six days following the introduction of ICT were done all highlighted in this chapter. Section 4.2 is summary statistics and 4.3 present the impact of ICT on stock returns and trading volumes.

#### 4.2 Summary Statistics

The study computed the mean of mean return and trade changes in trade volume in the same period. The above information is presented in the table 4.1 below.

**Table 4.1: Mean returns and mean volumes for 45 firms**

Day	mean return	volumes
-6	-0.036	0.004691
-5	-0.020	0.024623
-4	0.005	0.002479
-3	-0.359	0.029835
-2	0.148	0.011963
-1	0.053	0.046579
0	0.098	0.237814
1	0.114	0.033649
2	0.246	0.041191
3	0.262	0.094143
4	0.342	0.062639
5	0.361	0.055355
6	0.445	0.048175

From the above information the study calculated the mean of the above data, standard

deviation, skewness, kurtosis and variance of the same the above information was presented in the table 4.2 below.

**Table 4.2: Statistics for Mean returns and mean volumes for 45 firms**

	Mean	Median	Std. Deviation	Variance	Skewness	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis
mean return	0.127	0.114	0.21226	0.045056	-0.685	0.616	1.049	1.191
volumes	0.053	0.041	0.06085	0.003703	2.616	0.616	7.915	1.191

From the findings in table 4.2 s the study found that that the market was very sensitive to various change that were as result of adoption of ICT at NSE, the daily mean return had a mean of 0.12 and standard deviation of 0.212, this was also seen in the case of trade volume where trade volume had a mean of 0.053 and standard deviation of 0.06. from the value of skewness it was observed that the data on trade volume and mean daily return was skewed toward the 0.616 which mean that the data was skewed toward the event day (day of adoption of ICT at NSE) this shows that major fluctuation in the market were surrounding the event day. This information indicated that market was very sensitive to various changes. From the above information the study found that the market was very sensitive to changes that were being brought about by adoption of ICT in the NSE as shown by various market performance measures. These finding are also consistent with those in Brown and Warner (1980, 1985), which suggest that simple statistic models as the mean-adjusted returns model often produce comparable results to those of more sophisticated models.

### 4.3 The impact of ICT on Stock Returns and Trading volumes

Figure 4.1: Graph Mean returns and mean volumes for 45 firms



According to figure 4.1 mean return and trade volumes fluctuation were very low before adoption of ICT nearing the event day they were slightly greater fluctuation in the value of trade volumes and mean daily return, mean daily return was seen to be lagging behind the trade volumes. Two days prior to the adoption of ICT there was slightly greater fluctuation in both mean daily return and trade volumes. On the event day trade volumes realized a greater fluctuation compared to mean daily return after the event day there were greater fluctuation in both the trade volumes and mean daily return and trend continued all the way up to the six day. This information shows that the adoption of ICT by NSE increased the mean daily return and trade volume.

## CHAPTER FIVE

### SUMMARY AND CONCLUSIONS

#### 5.1 Introduction

This chapter presents summary and conclusion of the study. Section 5.2 gives the summary of the key findings and section 5.3 presents the conclusion. Section 5.4 is the limitations of the study and section 5.5 gives the recommendations for further research.

#### 5.2 Summary of the Key Findings

From the findings, the study found that the market was very sensitive to various changes that were as a result of adoption of ICT at NSE, the daily mean return had a mean of 0.12 and standard deviation of 0.212, this was also seen in the case of trade volume where trade volume had a mean of 0.053 and standard deviation of 0.06. From the value of skewness it was observed that the data on trade volume and mean daily return was skewed toward the 0.616 which means that the data was skewed toward the event day (day of adoption of ICT at NSE) this shows that major fluctuations in the market were surrounding the event day. This information indicated that the market was very sensitive to various changes.

From the above information the study found that the market was very sensitive to changes that were being brought about by adoption of ICT in the NSE as shown by various market performance measures. These findings are also consistent with those in Brown and Warner (1980, 1985), which suggest that simple statistical models as the mean-adjusted returns model often produce comparable results to those of more sophisticated models. These findings are also consistent with those in Brown and Warner (1980, 1985), which suggest that simple statistical models as the mean-adjusted returns model often produce comparable results to those of more sophisticated models. The findings are also in line with the findings of McKenzie & Faff (2003) who found that the conditional correlation of stock returns is highly dependent on trading volume for individual stocks but not for the index. Guner & Onder (2002) found out a significant relationship between volatility and trading volume. Specifically, they have found out that even though higher volatility is associated with low volume stocks in general, for

morning session, high volume stocks also exhibit high volatility stemming from the intensity of information-based trading for high volume stocks in stock market opening.

From the finding of the graphical presentation the study found that mean return and trade volumes fluctuation were very low before adoption of ICT. Nearing the event day they were slightly greater fluctuation in the value of trade volumes and mean daily return, mean daily return was seen to be lagging behind the trade volumes. Two days prior to the adoption of ICT there was slightly greater fluctuation in both mean daily return and trade volumes. On the event day trade volumes realized a greater fluctuation compared to mean daily return. After the event day there were greater fluctuation in both the trade volumes and mean daily return and trend continued all the way up to the six day. This information shows that the adoption of ICT by NSE increased the mean daily return and trade volume.

The changes in the trade volume and mean daily return could be attributed to information asymmetry / efficient market hypothesis which is in line that Market efficiency does not require that the market price be equal to true value at every point in time (Rouwenhorst & Geert, 2009). All it requires is that errors in the market price be unbiased, i.e., that prices can be greater than or less than true value, as long as these deviations are random. The fact that the deviations from true value are random implies, in a rough sense, that there is an equal chance that stocks are under or over valued at any point in time, and that these deviations are uncorrelated with any observable variable. Technology allows information to be disseminated to a broad base of investors in real time and at low cost, thus expanding the universe of investors with access to information. Second, technology is also reducing the barriers to entry for providing financial services (e.g. market making and brokerage) and the resulting competition is driving down transaction costs. In addition to facing lower commissions, institutional and retail investors – aggressively pursued by competing intermediaries - now enjoy unprecedented ease of trade execution (via such innovations as online accounts). These changes are expanding market participation and facilitating dramatic increases in trading volume (Bollerslev & Jubinsk, 1999).

### **5.3 Conclusions**

Based on the findings presented in chapter four and discussed above, the study concludes that the market was very sensitive to adoption of ICT at NSE where there was significant increase in mean daily returns and trade volume which could be attributed to Technology allows information to be disseminated to a broad base of investors in real time and at low cost, thus expanding the universe of investors with access to information. Second, technology is also reducing the barriers to entry for providing financial services (e.g. market making and brokerage) and the resulting competition is driving down transaction costs, the study therefore conclude that adoption of OICT impacted positively on the trade volume and mean daily returns .

### **5.4 Limitations of the Study**

As a part time student who needs to balance with studies with full time employment, the researcher was not be able to undertake an extensive and exhaustive research limiting the researcher less research time. The researcher was a self-sponsored student relying on savings to progress his studies and therefore there was limitation on financial resources and hence the researcher secondary data only.

### **5.5 Recommendations for Further Research**

This study concentrated on the impact of ICT on stock returns and trading volume. There are other factors that affect stock returns and trading volume and therefore this study recommends that more studies should be done in the area of factors affecting stock returns and trading volume for companies quoted in Nairobi Stock Exchange.

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